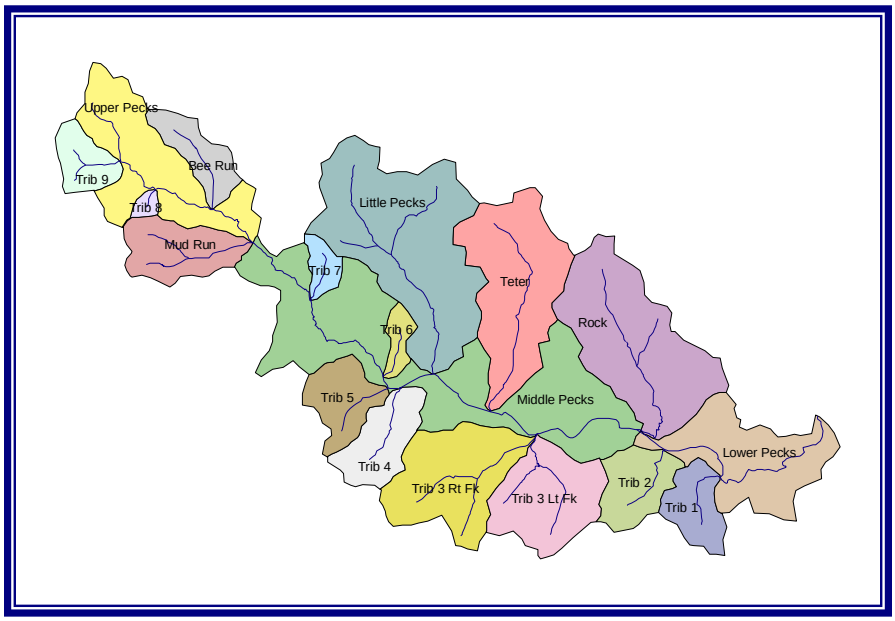
WATERSHED-BASED PLAN

FOR PECKS RUN WATERSHED, WV



Prepared by:

The Highlands Institute for Environmental Research and Education

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Contributors

Jeffrey Simmons	The Highlands Institute for Environmental Research and Education
Paul Richter	Buckhannon River Watershed Association, Chair
Don Gasper	Buckhannon River Watershed Association, member
Kathy Cantrell	Environmental Specialist, WV Conservation Agency
Lou Schmidt	WV DEP Non-Point Source Program
Alvan Gale	WV DEP Non Point Source Program
Teresa Koon	WV DEP Non Point Source Program
Russell Shepherd	OSM student intern

Introduction

"Pecks Run (WVMTB-5) rises in Upshur County near the corner of Barbour, Harrison and Upshur counties at an elevation of 1,620 feet. It flows southeastward and empties into the Buckhannon River at Hall Station in Barbour County at an elevation of [1,360] feet. This stream is 9 miles long and has an average fall of [27] feet per mile. Tributaries of Pecks Run include Rock Run, Mud Run, Bee Run, and Little Pecks Run along with a few unnamed tributaries."

"The mean annual precipitation of this watershed is approximately 44 inches. The highest elevation in the watershed is approximately 1,873 along the ridges above Pecks Run headwaters in Upshur County. The lowest elevation is approximately 1,360 feet at the mouth of Pecks Run in Barbour County. The drainage area is about 13.4 square miles or 8,600 acres. The population of the watershed is approximately 600 people. Hodgesville, with a population of approximately 40 people, is the only town in the subwatershed" (WV DEP 2000).

The three dominant water quality problems within the watershed are metals, sediment, and fecal bacteria. The main sources of these contaminants are coal mining, agriculture, logging, and gas well roads. This plan will elucidate the sources of contamination and describe the steps that will need to be taken to achieve load reductions in metals, sediment, and fecal bacteria due to non-point sources; permitted sources of pollution will not be addressed. This report was prepared by The Highlands Institute for Environmental Research and Education at West Virginia Wesleyan College for the Buckhannon Framework Steering Committee and the WV Department of Environmental Protection.

A. Causes and Sources of Non-Point Source Pollution

A.1 Geographic Extent

The population density in Pecks Run Watershed is low. Over half of the land in the watershed is forested and about one-third is used for agriculture. More details can be found in Table 1. For the purposes of this report Pecks Run Watershed was divided into 18 subwatersheds (Figure 2).

Table 1. Land use in the Pecks Run Watershed according to 1993 GIS land use coverage (WV DEP 2000).

LAND USE	ACRES	%
Forested	5,365	61.9
Agriculture	3,147	36.3
Urban	26	0.3
Barren	0	0
Strip Mine	110	1.3
Waters/Wetland	24	0.2
TOTAL	**8,672**	**100.0**

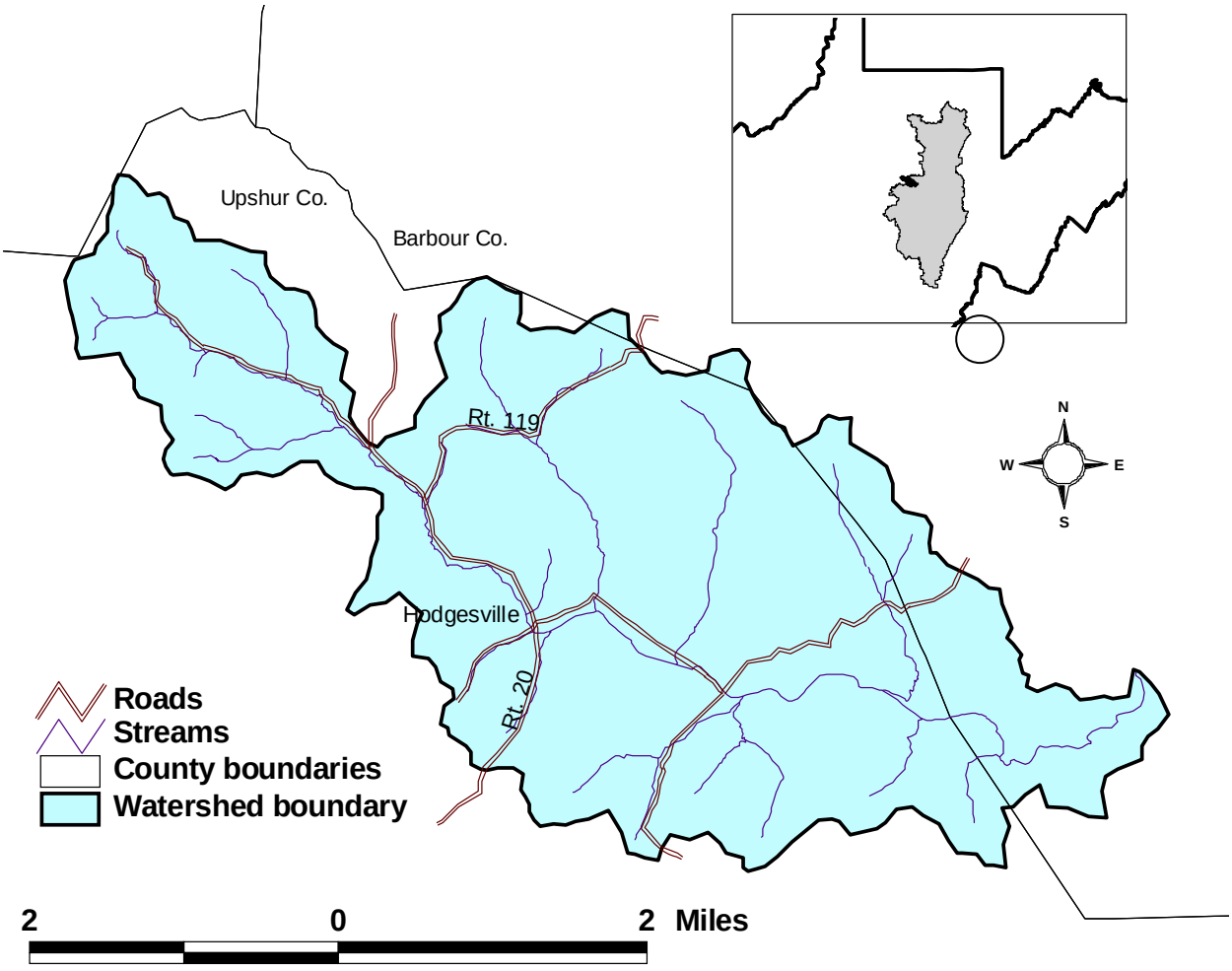

Figure 1. Map of Pecks Run watershed showing the watershed boundary, streams, roads and county boundaries.

Table 2. Subwatershed names, areas, and stream miles for Pecks Run Watershed based on 2003 GIS DRG maps (see Figure 2).

Subwatershed Name	**Area** *(acres)*	**Stream Miles** *(mi)*
Lower Pecks	621	2.6
Middle Pecks	1,510	4.8
Upper Pecks	660	2.3
Tributary 1	214	0.6
Tributary 2	256	0.7
Rock	922	2.6
Tributary 3 Rt. Fk.	601	1.7
Tributary 3 Lt. Fk.	486	1.9
Teter	783	2.0
Tributary 4	283	0.9
Tributary 5	250	0.7
Little Pecks	1,202	3.5
Tributary 6	78	0.5
Tributary 7	85	0.5
Mud Run	318	1.5
Bee Run	205	0.9
Tributary 8	31	0.2
Tributary 9	167	0.7
Total	**8,672**	**28.6**

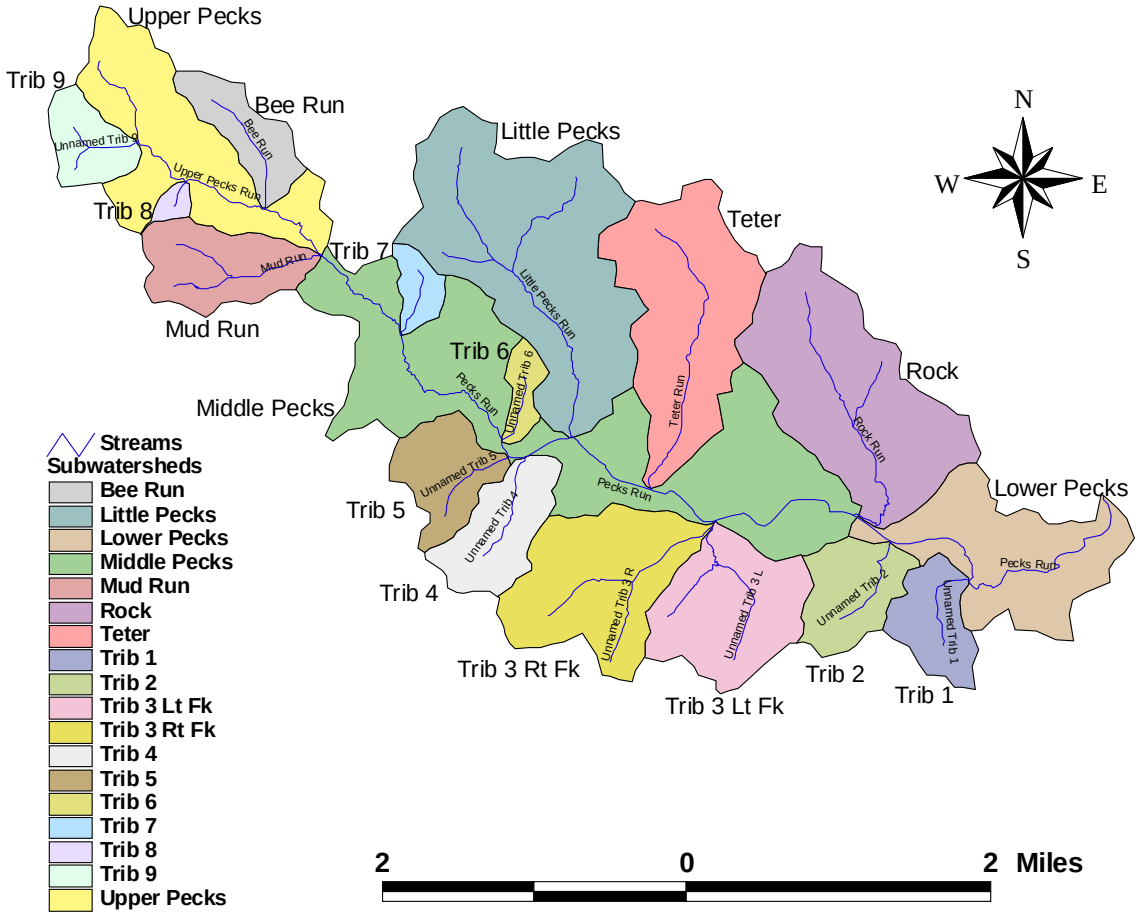

Figure 2. Map of Pecks Run watershed showing the eighteen subwatersheds and stream names.

A.2. Measurable Water Quality Goals for Pecks Run

Metals: Achieve load reductions in iron, manganese, and aluminum to achieve 100% compliance with state water quality criteria in all streams in the watershed through load reductions and mitigation strategies. In B-1 and B-2 waters the iron criteria are 1.5 and 0.5 mg L^{-1}, respectively. For aluminum the criterion is 0.75 mg L^{-1}. The human health criterion for manganese is 1.0 mg L^{-1}.

Sediment: There are no state water quality criteria for sediment and there is little information available on sediment loads in the watershed so a water quality goal cannot be established. However, sediment sources can be quantified. Our goal is for 100% of stream miles in the watershed to achieve a Score of 180 or greater using the Rapid Habitat Assessment (RHA) Index, which ranges from 12 to 240 (WV SOS 2004).

Fecal Bacteria: Reduce loads and/or mitigate surface water to achieve 100% compliance with state water quality criteria for fecal coliform in all streams in the watershed. The state water quality standard for fecal coliform for recreational waters is no more than 200 CFU per 100 mL as a monthly geometric mean based on not less than 5 samples per month nor more than 400 CFU per 100 mL in more than ten percent of all samples taken during the month. Because bacteria and sediment are so closely linked a secondary goal is for 100% of stream miles in the watershed to achieve a Score of 180 or greater using the Rapid Habitat Assessment (RHA) Index (as stated for sediment above).

Biological Integrity: Most of the pollutants listed above have a negative impact on the biota of streams. To ensure that the biological integrity of streams is being preserved and maintained, biological assessments of streams should be conducted. These biological assessments of fish and benthic macroinvertebrate diversity and abundance answer the ultimate question, “Is overall water quality good enough to support a viable stream community?” Furthermore, bioassessments complement point-in-time chemical sampling because they are time-integrated measures of water quality. The goal here is a rating of 68% or better on the WV Stream Condition Index (WVSCI) for all streams in the watershed.

A.3. Causes and Sources of Pollution

In this section of the report we attempt to quantify the sources of contaminants. This is a challenging undertaking because the data are dispersed among diverse federal and state agencies and private organizations. Nonetheless we are confident we have gathered together all of the most recent and most relevant data that exist for this watershed.

A.3.a. Metals

The main source of metals in the watershed is acid mine drainage (AMD) apparently from abandoned mines (raw AMD) although permitted mine discharges also contribute small amounts. Four streams in the watershed were listed as impaired on the state's 1998 303(d) list yielding a total of 12.6 miles of impacted stream out of a total of 28.6 miles in the watershed (Table 3; Figure 3). Because of recent changes in listing criteria, none of these streams appear on the 2002 303(d) list.

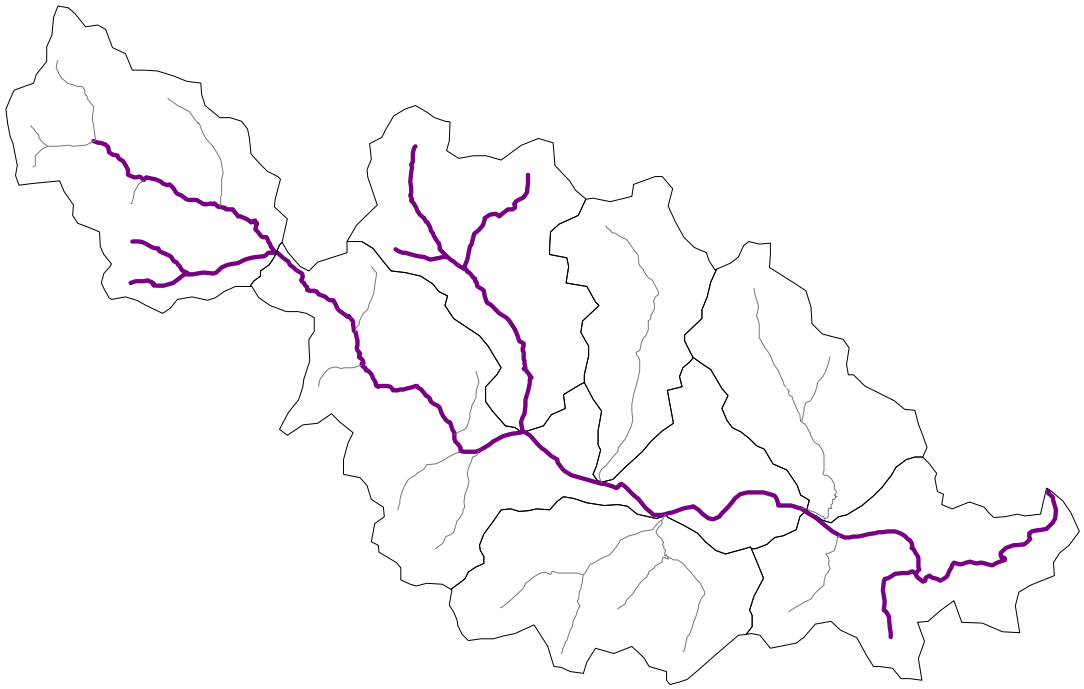

Figure 3. Illustration of streams in Pecks Run watershed impaired by acid mine drainage according to the 1998 WV 303(d) list. Streams in bold purple are impaired. Thin, gray streams have no data or are not impaired.

Table 3. Streams impaired by acid mine drainage according to the 1998 303(d) list.

Stream Name	Stream Miles Affected
Pecks Run	8.20
Trib 1	0.69
Little Pecks Run	2.49
Mud Run	1.18
Total	**12.56**

Chemical sampling by the Stream Restoration Group (WV DEP) and The Highlands Institute at West Virginia Wesleyan College has documented several other streams that appear to violate water quality standards for metals, although the number of samples taken in most cases is small (see Table 4). Nine stream reaches comprising a total of 11.2 miles had high metal concentrations which were indicative of AMD contamination. These streams were distributed throughout nine of the eighteen subwatersheds.

Table 4. Measured water quality parameters for select streams in the Pecks Run Watershed categorized by subwatershed. Samples were collected by West Virginia Wesleyan College's Environmental Laboratory and the WV Stream Restoration Group between 1997 and 2002. Only those samples with pH less than 5.75 or with Fe and Al concentrations greater than 0.5 and 0.75, respectively, are presented. This list represents the potential sources of pollutant loads in the Pecks Run watershed. Asterisks denote streams that are listed on the state's 1998 303(d) list. Bold values exceed state water quality criteria.

Site Description	Sub-watershed	Collected Yr.	Mon	Day	Field Cond *(uS/cm)*	Field pH	Total Acidity *(mg/L)*	Total Fe *(mgL)*	Total Mn *(mg/L)*	Total Al *(mg/L)*	Miles *(mi)*
Pecks Run at mouth*	Lower Pecks	2002	5	2	335	7.38	2	**2.97**	0.235	**2.48**	1.80
Little Pecks Run near mouth*	Little Pecks	2002	5	2	249	7.32	1	**0.76**	0.445	0.39	1.09
Left Fork of Unnamed Tributary 3 near mouth	Trib 3L	2002	5	2	70	6.75	2	**1.37**	0.275	0.68	1.09
Right Fork of Unnamed Tributary 3 near mouth	Trib 3R	2002	5	2	392	6.99	3	**1.08**	0.504	0.59	1.33
Rock Run near mouth (Reger Church)	Rock	2002	5	2	196	6.76	2	**1.55**	0.219	0.69	1.99
Teter Run	Teter	2002	5	5	555	7.17	3	**1.04**	0.793	0.65	2.01
Unnamed Tributary 4 at mouth	Trib 4	2002	5	2	694	7.72	3	**1.33**	0.151	**0.85**	0.77
Unnamed Tributary 5 at mouth	Trib 5	2002	5	2	643	6.96	6	**2.16**	0.116	**1.52**	0.62
Unnamed Tributary 8 at mouth	Trib 8	2002	5	2	362	7.60	1	**1.00**	0	0.67	0.49
										Total Miles:	**11.2**

GIS files from the WV DEP show a total of nine mining permits in Pecks Run watershed with a total area of 155.7 acres (Table 5; Figure 4). Of the nine permits, six are active, one was revoked, one is Phase 1 release, and one is inactive. They are located in the Upper Pecks, Middle Pecks, Little Pecks, and Teter subwatersheds.

Table 5. List of mining permits within Pecks Run watershed according to WV DEP GIS shape files.

ID No.	Area (ac)	Permit Number	ID No.	Area (ac)	Permit Number
1	21.58	o001183	6	3.37	s200892
2	21.93	s201087	7	42.24	s200996
3	0.18	u201197	8	18.39	o202586
4	0	s200299	9	20.32	d007882
5	27.76	o004483	**Total**	**155.7**	

Ten abandoned mine land (AML) Problem Areas and one bond forfeiture site are recorded within Pecks Run watershed (Table 6; Figure 4; WV DEP 2000). These are located in all the subwatersheds with the exception of Upper Pecks and most heavily concentrated in Middle Pecks. Topographic maps show additional surface mine sites that are reclaimed and no longer active but may contribute AMD to streams.

Table 6. List of abandoned mine land sites (AML) within the Pecks Run watershed according to WV DEP GIS shape files.

ID No.	Priority	PAD Number	ID No.	Priority	PAD Number
1	2	WV 0971	6	2	WV 4376
2	2	WV 2235	7	1	WV 4478
3	1	WV 2583	8	2	WV 4936
4	3	WV 3252	9	1	WV 5425
5	2	WV 3633	10	1	WV 5765

In summary, high metal concentrations have been found in every subwatershed except for Tributaries 2, 6, 7, and 9, Upper Pecks and Bee. There are three possible sources for these metals: active and permitted mines, abandoned mine lands, and reclaimed mines. Active, permitted mines are point sources so no reclamation plan is needed for those sources. The locations of abandoned mine sites and reclaimed mines are known, yet it is often impossible to attribute metal contamination at the mouth of a stream to a particular source farther upstream without more intensive sampling.

Figure 4 shows the locations of mine lands in Pecks Run watershed and Table 7 shows calculated loads from several of the subwatersheds. The only possible sources in Bee, Trib 8, and Upper Pecks subwatersheds according to Figure 4 are permitted sources, so these loads can be ignored. Trib 5, which is the single largest source of metals in the watershed, contains only AML sites; therefore, these two abandoned mine land areas (WV4478 and WV5765) are the most likely sources of metals. Subwatersheds Rock and Trib 3L contain only reclaimed mines, so these are the probable sources of the metals. Of the above subwatersheds, Trib 5 and Rock subwatersheds appear to make the biggest contributions to metals in Pecks Run and should be the top priority for reclamation.

The sources of metals in the remaining subwatersheds in Table 7 are more difficult to specify. Subwatersheds Trib 3R and Trib 4 have both AML and reclaimed mine sites within their borders. Without additional sampling it is not possible to tell which of these two potential sources is responsible for the metals in the stream. Similarly, subwatersheds Little Pecks and Teter contain both permitted sites and reclaimed sites and distinguishing between these two types of sources will require further investigation. Categorization of metal sources is important because the category determines which government agency is responsible for addressing the problem and which types of funding are available (e.g., Section 329 funds may only be used for non-point source pollution).

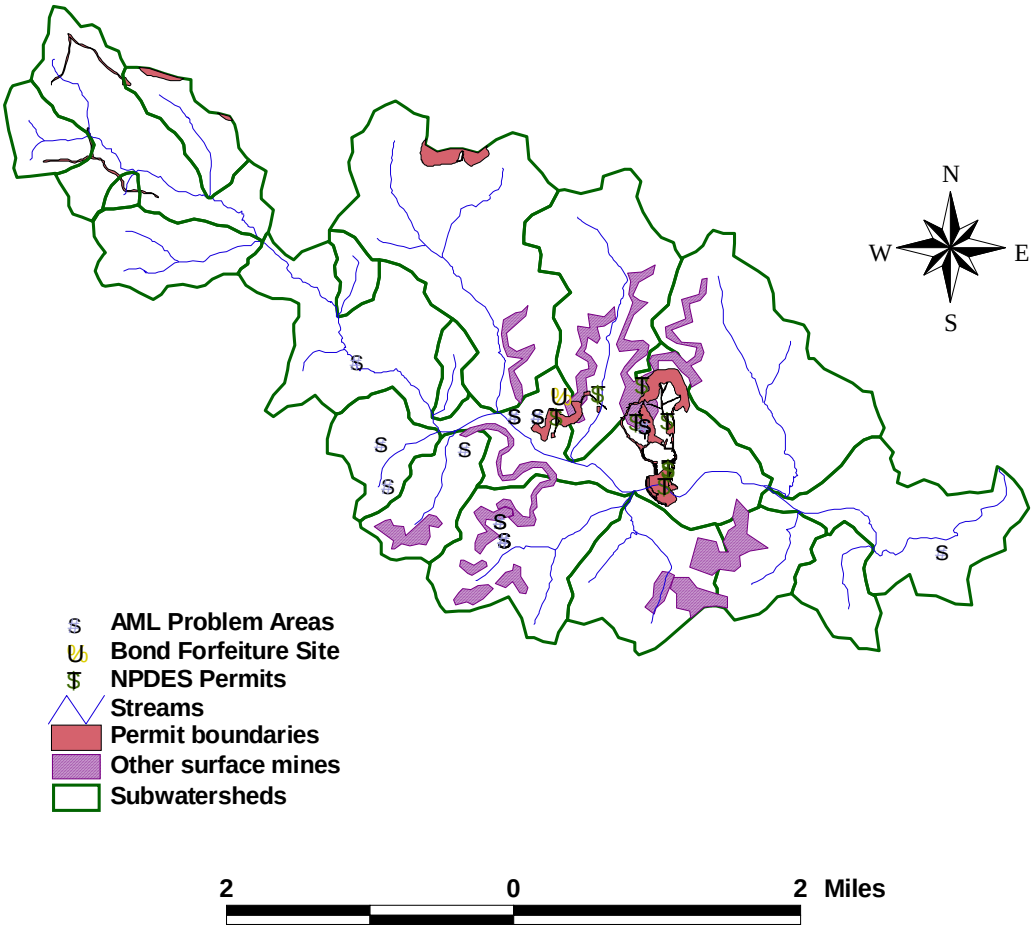

Figure 4. Map of Pecks Run watershed showing current mining permits, AML problem areas, bond forfeiture sites, and NPDES discharges. Source: WV DEP 2004

Table 7. Calculated loads of metals for Pecks Run subwatersheds. Calculations are based on only two stream sampling data. The row "Others" was calculated as the difference between the "Pecks Run at Mouth" load and the sum of the other subwatershed loads and represents other sources of metals as well as in-stream processes such as precipitation reactions.

	Aluminum Load *(lbs yr^{-1})*	**Iron Load** *(lbs yr^{-1})*	**Manganese Load** *(lbs yr^{-1})*	**Source**
Unnamed Tributary 5 at mouth	8,380	11,800	1,580	AML
Right Fork of Tributary 3 near mouth	1,450	2,540	1,550	AML, Rec.
Unnamed Tributary 4 at mouth	190	340	110	AML, Rec.
Left Fork of Tributary 3 near mouth	1,120	3,450	900	Rec.
Rock Run near mouth	2,170	5,730	1,510	Rec.
Little Pecks Run near mouth	2,570	8,320	6,540	Permit, Rec.
Teter Run at mouth	590	1,280	1,530	Permit, Rec.
Bee Run at mouth	90	160	0	Permit
Unnamed Tributary 8 at mouth	320	470	0	Permit
Upper Pecks Run	2,310	4,840	0	Permit
Mud Run near mouth	730	1,000	0	unknown
Others	40,980	38,970	-7,950	
Pecks Run at mouth	60,900	78,900	5,770	

A.3.b. Sediment

Sediment from Agriculture

Approximately 36% of the watershed land is under agricultural use (Table 1). Most of the 25 farms present in this watershed are involved in hay and beef production with an average of 30 head of cattle per herd. There are about 50 sheep and 10 hogs in residence as well. Three of the 25 farms, or 12%, have management plans (WVDEP 2000). Visual inspection of several farms shows the potential for erosion and sediment influx to streams due to lack of riparian buffer zones and lack of streamside fences. Furthermore, most of the farms are located in the flat floodplain adjacent to streams.

Sediment from Forestry

The Upper Buckhannon River watershed is about 62% forested. Both deciduous and mixed forests are common in this watershed. In 2003, there were no logging operations registered with the WV Division of Forestry (Jim Hayes, personal communication). All registered logging operations use BMP's. Log jobs are checked frequently by the local WV Division of Forestry Forester to make sure BMP's are being implemented correctly. Instances do occur in which log jobs go unregistered, therefore it is unknown what types of BMP's if any these operations use.

Sediment from Oil and Gas Roads

There are approximately 127 oil and gas wells within the Pecks Run watershed (WV DEP 2000). The status of these wells is described in Table 8. There is tremendous erosion potential from these widespread sources (Figure 5). Within the Buckhannon River Watershed approximately 0.3 miles of access road is associated with each well according to the WV Office of Oil and Gas. Therefore, there should be approximately 38 miles of oil and gas roads for the 127 wells in Pecks Run watershed.

Table 8. Status of oil and gas wells within the Pecks Run watershed in 1999 (WVDEP 2000).

STATUS	# OF WELLS
Unknown	2
Abandoned	14
Active	77
Never Drilled	1
Plugged	33
Total	**127**

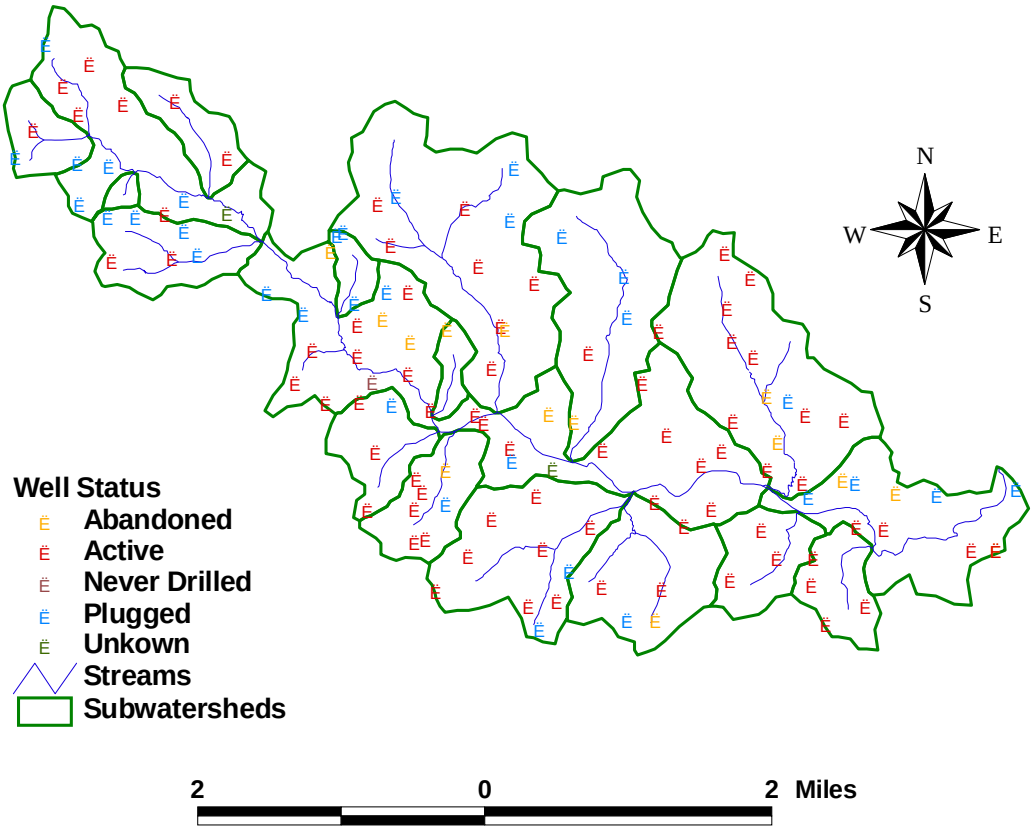

Figure 5. Map of Pecks Run watershed showing locations of the 127 gas wells. Source: WV DEP 2004

A.3.c. Biological Integrity

The Rapid Habitat Assessment (RHA) Score is a combination of scores that measure: in-stream cover, substrate size, embeddedness, velocity/depth regime, channel alteration, sediment deposition, riffle frequency, channel flow status, bank condition, bank vegetative protection, grazing, and riparian vegetation zone width. In 1997 WVDEP conducted an ecological assessment of the Tygart Valley River Watershed, which includes Pecks Run watershed. Three stream sections in Pecks Run watershed were assessed. The average score was 133 (on a scale of 12 to 240) which is considered sub-optimal. The highest score was 154 (sub-optimal) and the lowest was 107 (marginal). Two of the three streams fell in the sub-optimal range (120 to 180) and one fell in the Marginal range (60 to 120). Thus, stream habitat overall is not adequate to sustain healthy biological communities (Table 9).

Table 9. Habitat and biological assessment of Pecks Run watershed. Bold values indicate WVSCI scores < 61 (impaired) or Habitat Scores less than 120 (poor to marginal). Source: WVDEP (2000).

Stream Name	Subwatershed	WVSCI	RHA Score
Little Pecks Run	Little Pecks	**39.8**	139
Mud Run	Mud	**43.1**	**107**
Pecks Run (mouth)	Lower Pecks	71.9	154
Average		**51.6**	133

During that same 1997 assessment the WVDEP evaluated biological integrity of using the WV Stream Condition Index (SCI) based on benthic macroinvertebrate counts. The SCI is a combination of six different metrics that assess the diversity and abundance of macroinvertebrate populations. The scale ranges from 0 to 100 with categories of Impaired (0 to 61), Gray Zone (61 to 68), and Good (68 to 100). Three stream sections were assessed and they had an average score of 51.6 (on a scale of 0 to 100) which is just below the “gray zone” in the “Impaired” category. The highest score was 71.9 (Good) and the lowest was 39.8 (Table 9).

In June 2004 The Highlands Institute conducted an intensive but limited survey of riparian zones in Pecks Run watershed. Riparian zone width and degree of vegetation were evaluated along 48 stream reaches within the watershed using the Rapid Habitat Assessment metric (1-5, poor; 6-10, marginal; 11-15, sub-optimal; 16-20, optimal). Of the 12 stream miles assessed, 4.3 were categorized as poor, 4.9 as marginal, 1.3 as sub-optimal, and 1.5 as optimal. Because sampling was not random, we cannot extrapolate to the whole watershed. However, these data document that at least 9.2 miles of riparian zone need improvement. Furthermore, 7.8 of the 9.2 stream miles with inadequate riparian zones were located in pastures with no fences to exclude cattle from the stream channel.

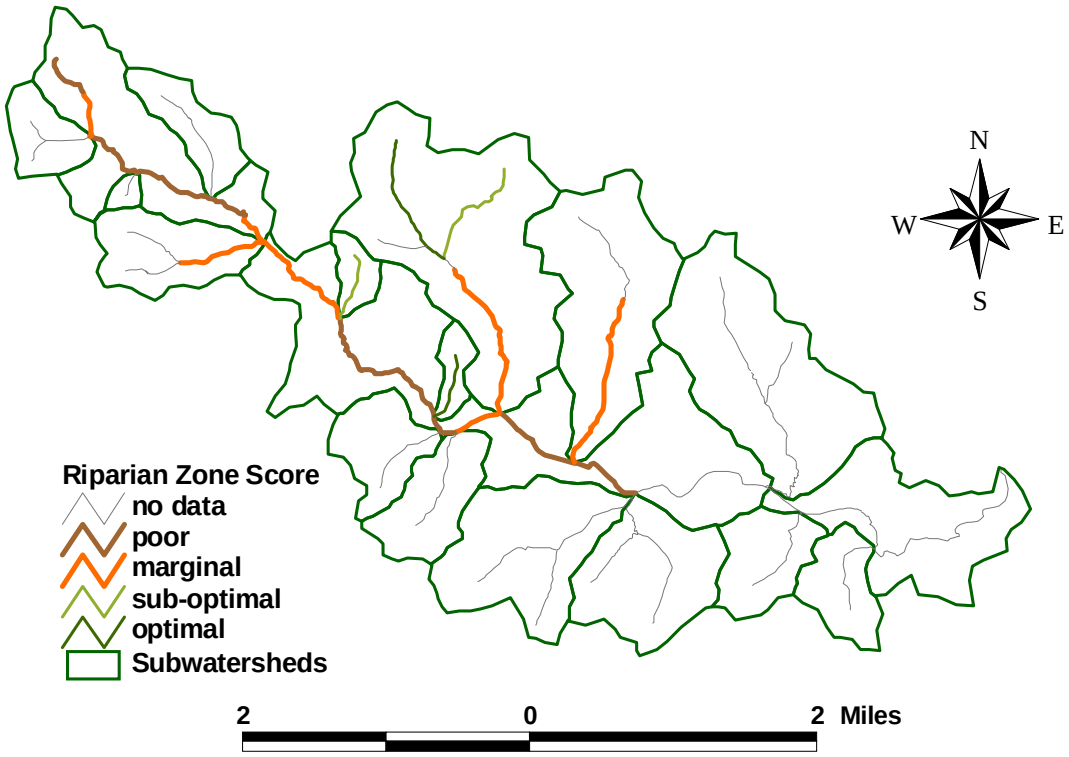

Figure 6. Map of Pecks Run watershed showing Riparian Zone scores for 48 stream reaches. The Rapid Habitat Assessment metric was used to quantify the quality and width of the riparian zone.

A.3.d. Fecal Bacteria

A modest amount of bacterial data are available for Pecks Run watershed. The Watershed Assessment Program sampled three locations in 1997. The Stream Restoration Group (WVDEP) made a sweep of the watershed in May 2002, sampling 15 locations. The Highlands Institute collected the most recent samples from seven sites in 2004. All of these data are presented in Table 10. With the exception of two, all sites violated state water quality criteria.

Table 10. Fecal coliform concentrations (CFU per 100 mL) in Pecks Run and its tributaries on three different sampling dates. Streams with an asterisk violated state water quality on at least one of the dates.

			Collection Date		
Description	**Subshed**	**Stream Miles**	**1997**	**May 2002**	**July 2004**
Pecks Run at mouth*	Lower Pecks	1.8	16	4,500	700
Rock Run near mouth*	Rock	1.0	--	910	680
Left Fork of Unnamed Tributary 3 near mouth*	Trib 3L	0.3	--	920	--
Right Fork of Unnamed Tributary 3 near mouth*	Trib 3R	0.7	--	3,800	--
Teter Run at mouth*	Teter	2.0	--	240	4,200
Little Pecks Run near mouth*	Little Pecks	1.2	520	370	1,475
Little Pecks Run near headwaters*	Little Pecks	1.1	--	300	2,580
Pecks Run upstream of Rock Run*	Middle Pecks	1.1	--	727	--
Unnamed Tributary 4 at mouth*	Trib 4	0.8	--	750	--
Pecks Run at Hodgesville *	Middle Pecks	1.1	--	--	6,200
Unnamed Tributary 5 at mouth*	Trib 5	0.6	--	260	--
Pecks Run upstream of Unnamed Tributary 6 *	Middle Pecks	0.3	--	520	250
Unnamed Tributary 8 at mouth	Trib 8		--	191	--
Mud Run near mouth*	Mud	0.6	488	730	--
Bee Run at mouth*	Bee	0.9	--	320	--
Pecks Run near Headwaters	Upper Pecks		--	64	--
Total Impaired Miles		**13.5**			

The large number of livestock farms situated adjacent to streams in which there are no fences to exclude cattle and inadequate riparian buffer zones strongly suggests that cattle are the main source of coliform (Figure 7).

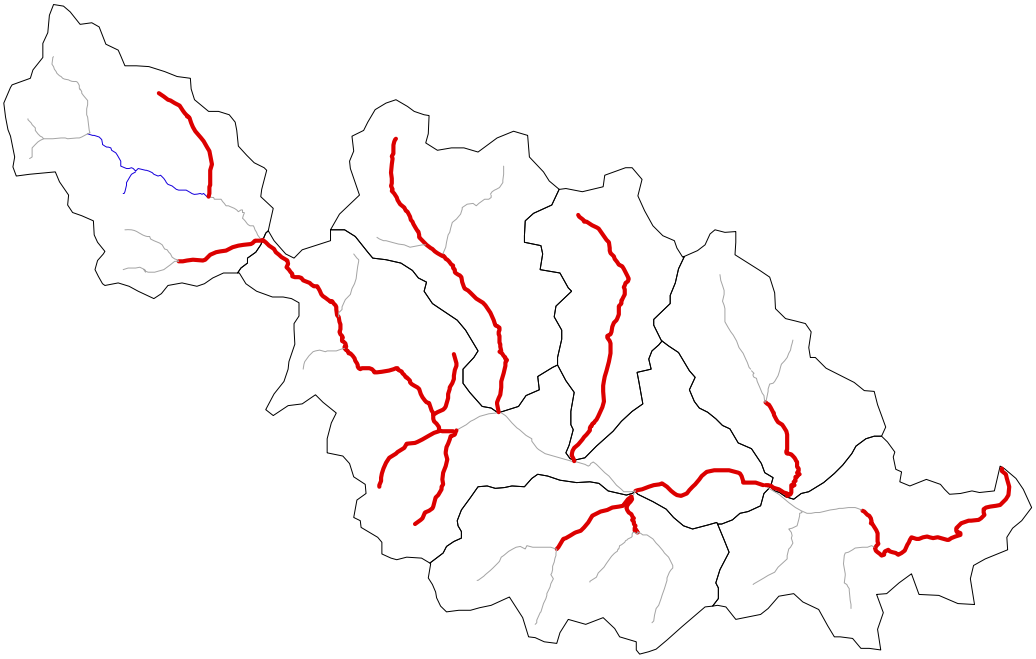

Figure 7. Illustration of streams impaired by fecal coliform bacteria. Streams in red, bold lines are violate state water quality criteria. Streams in thin, blue lines were in compliance. Thin, gray lines represent streams with no information.

B. Load Reductions Expected

B.1. Metals

Project 1: Subwatershed Trib 5 contributes approximately 8,380, 11,800, and 1,580 lbs yr^{-1} of aluminum, iron, and manganese, respectively, to Pecks Run. The proposed project includes identifying the source of metals, developing a reclamation plan, and implementing the reclamation project. Assuming that all of the metals will be removed by the treatment system, a load reduction of 8,380, 11,800, and 1,580 lbs yr^{-1} of aluminum, iron, and manganese, respectively, is expected. This equates to a 14% reduction in aluminum, a 15% reduction in iron, and a 27% reduction in manganese in Pecks Run.

Project 2: Load reductions from this project cannot be estimated until the sampling phase of this project is completed. However, we know that currently the four target subwatersheds (Trib 3R, Trib 3L, Little Pecks, and Rock) together contribute 7,310 lbs of aluminum, 20,040 lbs of iron, and 10,500 lbs of manganese to Pecks Run each year. If we assume a 50% reduction in these combined sources from this project, then we would expect load reductions of 6%, 13%, and 91%, respectively, for aluminum, iron, and manganese.

B.2. Sediment and Fecal Bacteria

Project 3: It is not possible to estimate reductions in sediment and fecal bacterial load in streams in the Pecks Run watershed. However, we can estimate the number of riparian zone miles that will be improved to the point where sediment inputs will be minimal. RHA scores indicate that at least 9.2 miles of riparian zone are marginal or poor.

Implementation of agriculture BMPs will restore approximately 5 miles of stream banks and riparian zones which will lead to a reduction in impaired riparian zone miles of 54%. Improvement of riparian buffer zones will also lead to a decrease in bacterial contamination of streams but it is not possible to quantify this reduction.

C. Nonpoint Source Management Measures

C.1. Project 1: Tributary 5 AML Reclamation

The single largest source of metals in Pecks Run watershed is Tributary 5. The Tributary 5 subwatershed contains about 0.62 miles of stream and is 250 acres in area. There are no known active mining permits and no reclaimed mine sites but two AML sites are listed (WV4478 and WV5765). It is assumed that one or both of these sites are the sources of metals. The first step in reclamation of this site will be confirmation of the sources through stream monitoring and site inspection. This will be accomplished by fall of 2005 through a cooperative effort among The Highlands Institute, Buckhannon River Watershed Association, WV Office of Abandoned Mine Lands and Reclamation, and WV Division of Water and Wastewater. The timing is fortuitous because the state's Watershed Assessment program will be conducting a watershed-wide sampling in 2005 in the Tygart Valley Watershed as part of the TMDL process. Funding will be sought from the state and from 319 funds.

At that point a reclamation plan can be developed that will be specific to that site by the end of 2006. It is likely that additional active treatment systems, like alkaline-amendment ponds, limestone channels or wetlands, will need to be installed. Surface water will be monitored for one year prior to and subsequent to project implementation which should occur in 2007. Funding for implementation may be available from the Abandoned Mine Lands Fund or from the Section 319 program

C.2. Project 2: Identification and Reclamation of Metal, Sediment, and Bacteria Sources in Pecks Run Watershed

Metals (Fe, Al, and Mn), sediment and bacteria are a problem in several locations throughout Pecks Run watershed. We have enough information to identify sources down to the subwatershed level and that information is presented in this report. However, before a comprehensive reclamation plan can be designed a more in-depth survey of each of the subwatersheds needs to be conducted in order to pinpoint all of the sources of contaminants.

Therefore, we propose to conduct intensive field surveys that will consist of site inspections, stream sampling, and habitat assessment. For AMD-impacted subwatersheds, surface water sampling at several locations will be used in conjunction with site inspection of all AML sites, reclaimed mines, and active mines to locate all sources of metal discharges with a focus on Trib 3R, Trib 3L, Little Pecks, and Rock subwatersheds. At the same time all streams will be evaluated using the Rapid Habitat Assessment technique to quantify potential sources of sediment and bacteria. Benthic macroinvertebrates will be collected in at least one location in each subwatershed to determine the WV Stream Condition Index. Sampling and site inspections will be completed by December 2005. College interns will be employed to help with the sampling effort.

The information gathered will be used to generate an extremely fine-scale watershed assessment report in Spring of 2006, which will then be used to prioritize sources of contaminants and to develop site specific reclamation plans by the end of 2006. From there we anticipate implementation of reclamation projects by the end of 2008.

Site inspections and assessments will be coordinated by the Buckhannon Framework Steering Committee subcommittee (see section C.5) and conducted by personnel from The Highlands Institute, Buckhannon River Watershed Association, WV Abandoned Mine Lands program, and the WV Division of Water and Wastewater. A public meeting will be held in the watershed in Spring 2005 for educational purposes and to solicit input and cooperation from local residents and mining companies. Funding will be sought from the state and from the 319 program. In addition, the federal Office of Surface Mining, The WV Stream Partners program, and WV Wesleyan college offer funds for college students to participate in watershed-related projects.

C.3. Project 3: Implementation of Agriculture Best Management Practices

Sediment and fecal bacteria reduction within an agricultural operation can best be achieved by the implementation of Best Management Practices or BMPs. These BMPs are designed and established to help reduce the delivery of agricultural nonpoint source pollution to state waters. A second benefit to the implementation of BMPs is that they can make a farmer's agricultural operation run more efficiently saving time and money. A few BMPs that reduce sediment and bacterial inputs to streams include: rotational grazing, fencing, alternative water sources, stream crossings, buffer and filter strip, riparian area development, winter feeding areas, and roof run-off management. These BMPs work to reduce water flow over bare ground, reduce the amount of bare ground, and encourage vegetative growth.

The WV Conservation Agency and the Natural Resources Conservation Service work with private landowners and farmers and encourage them to implement BMPs on their land through a series of incentive, education, and technical assistance programs. Two funding sources for these programs currently are EQUIP and CLEP programs. The WVCA and NRCS will also seek 319 funds to expand their ability to offer incentive programs and to offer a greater diversity of programs to landowners. WVCA estimates approximately 5 miles of streams and riparian zones in Pecks Run watershed will be improved by this project.

C.4. Project 4: Reclamation of Gas Well Roads

Many oil and gas roads are used as dual purpose roads by the oil and gas industry as well as the logging industry. Unauthorized ATV use on these roads has also been a significant contributor to excess sediment entering the streams. Poorly-designed and improperly maintained roads can lead to significant erosion and sedimentation of streams. Through the use of Clean Water Act Section 319 Incremental Project funds 3,600 feet of abandoned gas well roads will be restored in Pecks Run. This will be achieved through reshaping, installing breakers, diversions, broad-based dips, out-sloping and other Best Management Practices to control the velocity and discharge of water causing erosion and sediment deposition in streams**.** A demonstration project will be implemented in an effort to illustrate proper road design.

C.5. Project 5: Coordination and Education

Because of the multi-agency cooperation needed for efficient non-point source reclamation efforts, this plan would not be complete without a strategic plan for coordination and education. The Buckhannon Framework Steering Committee (BFSC) is a multi-organizational body that includes representatives from state, federal, and county agencies, non-profit interest groups, and business and is facilitated by Jennifer Pauer of the WV DEP. This makes it an ideal coordinating body for the watershed-based implementation plan.

A subcommittee of this group will be responsible for disseminating this plan to the BFSC, monitoring the progress of all non-point source projects, making annual reports to the BFSC, ensuring that monitoring is performed on schedule, gathering and storing monitoring data and other data, and revising the WIP as scheduled. The subcommittee will consist of at least four members of the BFSC including at least one Non-Point Source Specialist from the WV DEP and at least one representative of the Buckhannon River Watershed Association.

In order to evaluate the progress of implementation projects and to ensure that proper monitoring is conducted, a biennial Progress Report will be written by the subcommittee and submitted to the BFSC. The Highlands Institute for Environmental Research and Education has agreed to serve as the central repository for data.

The subcommittee will work with the Buckhannon River Watershed Association, The Highlands Institute for Research and Education, WV Conservation Agency, WV Division of Forestry, and WV Office of Oil and Gas to implement education and outreach objectives and to assess their effectiveness.

Monitoring for metals, sediment, and bacteria and periodic bioassessments require the coordination of several state agencies and other organizations (see section I). The subcommittee and the BFSC will be the coordinating bodies to avoid duplication of efforts and to ensure monitoring occurs on schedule. Benthic macroinvertebrate data, in particular, are lacking so collecting this information will be a high priority in the first few years.

Finally, in order to be able to calculate existing loads more accurately and to make predictions about load reductions, a simple hydrologic model of the watershed needs to be developed. Such a model will simulate water flow in the river mainstem as well as in major tributaries and be simple enough for the subcommittee to employ. There are several models available that could be adapted to Pecks Run. One is BASINS which is available from EPA. Another is being developed by Dr. Bruce Edinger at Salem International University in West Virginia.

All of the above activities will require a modest amount of resources that will be obtained through grant funding, in-kind matches (e.g., citizen volunteers), and state and federal operating expenses (i.e., employee time). There are many funding opportunities available for environmental education projects through the federal government (like EPA) and private foundations like SURDNA.

D. Financial and Technical Assistance Required for Implementation

D.1. Project 1: Tributary 5 AMD Reclamation

AMD reclamation for 0.7 miles (Table 2) of stream in Pecks Run watershed. WV DEP estimates an average of $300,000/mi for restoration of AMD-impacted streams including pre- and post-monitoring.

[0.7 mi. @ $300,000/mi]	$ 210,000
Project 1 Total:	**$ 210,000**

Technical Assistance

WV Office of Abandoned Mine Lands and Reclamation
WV Division of Water and Wastewater
National Mine Lands Reclamation Center, WV University
The Highlands Institute at WVWC
Buckhannon River Watershed Association

D.2. Project 2: Identification of Metal, Sediment, and Bacteria Sources in Pecks Run Watershed

Surface water chemistry sampling	
[60 samples at $120/sample]	$ 7,200
College Interns to conduct RHA surveys	$ 7,000
Project 2 Total:	**$ 14,200**

Technical Assistance

WV Office of Abandoned Mine Lands and Reclamation
WV Division of Water and Wastewater
WV Save Our Streams
The Highlands Institute at WVWC
Buckhannon River Watershed Association

D.3. Project 3: Implementation of Agriculture Best Management Practices

Fencing	$ 5,000
Critical Area Treatment	$ 3,000
Stream Crossing	$ 2,000
Water Supply	$ 8,700
Roofed Winter Feeding Areas	$ 27,000
Heavy Use Protection Area	$ 2,600
Roof run-off management	$ 1,300
Buffer and filter Strips	$ 1,000
Animal Waste Storage Facilities	$ 15,000
Habitat Assessment and Biological Monitoring	$ 3,300
Project 3 Total:	**$ 68,900**

Technical Assistance
WV Conservation Agency
USDA Natural Resource Conservation Service
The Highlands Institute at WVWC
Buckhannon River Watershed Association
WV Save Our Streams
WV University Extension Service

D.4. Project 4: Reclamation of Abandoned Gas Wells

The following costs include materials needed, dozer hours, inspector costs, as well as reseeding costs.

Well # 47 97 962P	$ 5,384
Well # 47 97 895P	$ 6,408
Well # 47 97 584P	$ 6,254
Well # 47 97 962	$ 13,260
Project 4 Total:	**$ 31,306**

Technical Assistance
WV Division of Water and Wastewater
WV Office of Oil and Gas

D.5. Project 5: Coordination and Education

Implementation of Education Projects	$ 4,000
Writing two Progress Reports	$10,000
Revising the WIP	$ 8,000
Developing hydrologic model	$ 6,000
Project 5 Total:	**$28,000**

Technical Assistance
The Highlands Institute
Buckhannon River Watershed Association
WV Division of Water and Wastewater
Buckhannon Framework Steering Committee

Table 11. Grand total for all five proposed projects.

	Estimated Costs
Project 1	**$ 210,000**
Project 2	**$ 14,200**
Project 3	**$ 68,900**
Project 4	**$ 31,306**
Project 5	**$ 28,000**
Grand Total	**$ 352,406**

E. Information and Education Component

E.1. Acid Mine Drainage

"Education" is featured prominently in the mission statements of both the Buckhannon River Watershed Association and the Highlands Institute for Environmental Research and Education at WVWC. These two organizations have a history of outreach and education in the local community and make use of a variety of media. The BRWA will keep local citizens informed through its newsletter, pubic forums, and educational displays at regional fairs and festivals. BRWA may also organize volunteer citizen monitoring of some of the AMD projects proposed herein. The Highlands Institute will convene meetings with state, county, and local agencies and facilitate communication among all participants.

E.2. Agriculture

Educating the agricultural community can bring about change. Through educational activities, workshops, and technical assistance landowners will be offered education concerning sediment, water quality, best management practices, as well as their surrounding environment. Technical assistance will be given to landowners who have questions or concerns about their agricultural operation. The Natural Resource Conservation Service and WV Conservation Agency will also promote their cost share programs from which both farmers and the environment can benefit. News releases and brochures will be used as methods to inform the public of upcoming events, and programs that are available to them.

E.3. Forestry

The West Virginia Division of Forestry holds several workshops each year for their staff and for loggers within the state. Workshops are held to certify loggers and timber operators. These workshops are designed to educate loggers and operators about our environment and Best Management Practices to use while harvesting timber. Landowners who use a properly licensed timber operator and a certified logger know the workers will use BMPs that reduce both soil erosion and water pollution.

E.4. Oil and Gas

Educating the public about the risks of using of oil and gas roads and pipelines as ATV roads is critical. Educational workshops, news articles, or demonstration projects to deter riders from these areas are key to their improvement. Similarly roads used by logging operations that are not brought back to oil and gas specifications also pose a problem. An education program used to teach loggers will be implemented in connection with the WV Division of Forestry concerning the use of oil and gas roads as logging roads, and how to bring them back to DEP standards.

F. Schedule of Implementation

Year	Qtr.	Project 1	Project 2	Project 3	Project 4	Project 5
2004	3rd		inspections; monitoring; assessment	obtain funding	obtain funding; pre-monitoring	
	4th	site identification				
2005	1st					
	2nd			implement program; pre- and post-monitoring on a per project basis; install BMPs	install project; promote demonstration project	Implement Education programs
	3rd	reclamation plan development; pre-monitoring				
	4th					Develop hydrologic model
2006	1st		Write assessment report			
	2nd				post-monitoring	write progress report
	3rd		develop reclamation plan; pre-monitoring			Implement Education programs
	4th	project implementation				
2007	1st					
	2nd					Implement Education programs
	3rd		project implementation			
	4th			final post-monitoring		
2008	1st	post-monitoring				
	2nd					write progress report
	3rd		post-monitoring			
	4th					
2009						revise WIP

G. Schedule of Interim Milestones

The first major milestone is in the middle of 2006 when this watershed-based plan will be revised or amended using information gathered in 2004 and 2005. Specifically, information collected for projects 1 and 2 will provide the site-specific information needed to identify sources of pollution and to calculate loads and load reduction targets. Once the WIP is revised or amended, then funding from the Section 319 program will be sought to implement restoration projects.

The second milestone will be in 2008 at which time projects 3 and 4 will be complete (except perhaps for some post-monitoring). The success at achieving the targeted load reductions will be evaluated at that point. If the expected load reductions are not achieved, then additional reclamation projects will be designed.

H. Criteria to be Used

H.1. Metals

Concentrations and loads of iron, manganese, and aluminum will be used as the criteria. Loads will be calculated using a computer model (see sections I and C.5.) and measured metal concentrations. The targeted load reductions for Project 1 are 14% for aluminum, 15% for iron, and 27% for manganese. Success at achieving these reductions will be determined in 2008.

H.2. Sediment and Fecal Bacteria

Because it is difficult to measure sediment loads directly, we will make use of indirect measures of sediment. The Rapid Habitat Assessment Index will be used to quantify stream channel and riparian zone quality and locations of BMPs that are installed will be recorded. Project 3 is predicted to restore 5 miles of stream channel (54% of the impaired stream miles) to an RHA Index of > 180. Monitoring for fecal coliform should show 100% of stream miles in the watershed to achieve water quality standards for 400 CFU/100ml. Whether or not that target is achieved will be assessed in 2008.

H.3. Biological Integrity

Bioassessment of benthic macroinvertebrates will be used to supplement the criteria listed above because periodic chemical sampling of specific pollutants may not provide a complete and accurate description of water quality. The WV Stream Condition Index will be used as the criterion for assessment. Values greater than 68% (Good category) are desirable. Streams will be assessed for this criterion in 2008.

I. Monitoring component

Monitoring is an essential component of a watershed-based implementation plan because it allows stakeholders to see what progress is being made and when goals are achieved. Monitoring will be a key component of each of the projects described in section C above. In general at least one year of chemical monitoring will be conducted before and after each project within the project's subwatershed (see section F). Habitat assessment and bioassessment will be conducted once before and one year after the completion of each project. Chemical sampling will be the responsibility of the organization that is conducting the reclamation. Habitat and bioassessment may be done by the reclaiming organization or by WV Save Our Streams or The Highlands Institute.

In addition to localized, project-related monitoring, watershed-wide surveys of water quality will take place at least every two years and will include all of the criteria listed in section H. These surveys may be conducted by WV DEP, BRWA, or The Highlands Institute. The Highlands Institute will serve as the data repository and will generate a biennial report on water quality in the watershed.

J. References

Simmons, J.A. 2003. The Buckhannon River Watershed: A Summary of Data – 2003. The Highlands Institute for Environmental Research and Education. Buckhannon, WV.

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